Published in final edited form as:

Child Youth Serv Rev. 2014 August 1; 43: 118–123. doi:10.1016/j.chilyouth.2014.05.015.

Reducing High Risk Behaviors among Street Living Youth: Outcomes of an Integrated Prevention Intervention

Jasmin Carmona^{a,*}, Natasha Slesnick^a, Xiamei Guo^a, and Amber Letcher^b

Jasmin Carmona: Carmona.12@osu.edu; Natasha Slesnick: Slesnick.5@osu.edu; Xiamei Guo: guo.124@osu.edu;
Amber Letcher: amber.letcher@sdstate.edu

^aDepartment of Human Sciences, The Ohio State University, 135 Campbell Hall, 1787 Neil Avenue, Columbus, OH, 43220, USA

^bDepartment of Counseling and Human Development, South Dakota State University, Box 2275A Brookings, SD 57007, USA

Abstract

Research efforts to reduce Human Immunodeficiency Virus (HIV) risk behavior among street living youth have shown disappointing outcomes, with few studies reporting reduced risk behaviors. The current study tested the impact of an integrated HIV prevention intervention, and predictors of change, for youth (N=270) between the ages of 14 to 20 years receiving substance use treatment through a drop-in center. Condom use, HIV knowledge, number of sexual partners and behaviors associated with an overall HIV risk index were assessed at baseline, 3, 6 and 12 months post-baseline. Findings suggest that HIV prevention integrated with substance use treatment is associated with increased condom use and reduced sex partners. However, the effects on condom use were short lived and dissipated by 12 months post-baseline. Higher treatment attendance and baseline substance use predicted increased condom use. Although no significant change was observed in the overall HIV risk index, increases in depressive symptoms were associated with increases in the index score, as well as more sexual partners. Future research should determine whether successful intervention requires reinforcement of risk reduction behaviors while youth remain homeless.

Keywords

HIV prevention; substance use; homeless youth

© 2014 Elsevier Ltd. All rights reserved.

*Correspondence concerning this article should be addressed to Jasmin Carmona, Department of Human Sciences, The Ohio State University, 135 Campbell Hall, 1787 Neil Avenue, Columbus, OH, 43220, USA. Fax number: +1 614 292 4365; Tel.: +1 614 292 7705.

Publisher's Disclaimer: This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

1. Introduction

Very few studies report positive changes in Human Immunodeficiency Virus (HIV) risk behaviors among street living homeless youth. This is of concern as homeless youth are one of the most vulnerable populations for contracting HIV, with studies reporting that between 2.3% to 12.9% of homeless youth under the age of 25 test positive for HIV (National Coalition for the Homeless, 2006). This rate is two to ten times higher than non-homeless peers. Contributing to the high rates of HIV, many researchers have documented high rates of alcohol and drug use, inconsistent use of condoms, earlier age of first intercourse, and multiple sexual partners among the young homeless (Halcón & Lifson, 2004; Haley, Roy, Leclerc, Boudreau, & Boivin, 2004; Marshall et al., 2009). Less clarity is available on how best to intervene in these high risk behaviors. HIV prevention interventions targeting homeless youth are challenging to implement and only a limited number of studies report some success (Naranbhai, Abdool, & Meyer-Weitz, 2011). Contributing to this small body of literature, the current study examines HIV risk behavior outcomes for an integrated HIV risk prevention intervention tested with substance use disordered street living youth between the ages of 14 to 20 years.

1.1 Intervention outcomes

Although few studies testing HIV preventions for homeless youth were found, the majority of those studies reported limited impact on high risk behaviors (Booth, Zhang, & Kwiatkowski, 1999; Gleghorn et al., 1997; Milburn et al., 2012; Rew, Fouladi, Land, & Wong, 2007). While knowledge can be increased among homeless youth (e.g., Nyamathi et al., 2013; Rew et al., 2007) and non-runaways (see review, McKay et al., 2004; Simoni, Nelson, Franks, Yard, & Lehavot, 2011), interventions to date have not dramatically reduced adolescent sexual risk taking (DiCenso et al., 2002; Picot et al., 2012). Showing promise, and using a younger, shelter-recruited sample of adolescents, Rotheram-Borus and colleagues (2003) tested an intervention (Street Smart) that included ten group sessions focusing on assertiveness, coping, access to medical care, harm reduction and condom use. Female adolescents reported reduced sexual risk in both the intervention and control conditions while males showed no behavior change. These authors concluded that gender should be examined as a moderator of change when studying HIV risk behaviors. Slesnick and Kang (2008) also showed some positive outcomes. In particular, the authors found that youth who received an integrated HIV prevention and behavioral treatment for substance use disorders showed a significant increase in condom use 6 months post-baseline than youth who did not receive the integrated treatment. Youth in both conditions reported a reduced number of sexual partners. In summary, successful strategies that significantly reduce HIV risk behaviors among homeless youth have had limited success, with an integrated intervention appearing to show some promise. Similarly, Gleghorn et al. (1997) concluded that successful interventions may need to address other relevant areas in youths' lives.

1.2 Predictors of HIV risk

In addition to experiencing the chaotic and unstable life of homelessness, homeless youth contend with high rates of substance use and depression, which are associated with elevated

risk behaviors (Marshall et al., 2009). Substance use is related to an increased number of sexual partners and decreased condom use (Solorio et al., 2008). Substance use disordered homeless youth also report high rates of survival sex and intravenous (IV) drug use (Haley et al., 2004; Kerr et al., 2009; Tyler, Gervais, & Davidson, 2013).

Similarly, studies indicate that depression is related to multiple sex partners and sexually transmitted infections (STIs; Mazzaferro et al., 2006; Rohde, Noell, Ochs, & Seeley, 2001). However, the relationship between condom use and depressive symptoms is unclear. One study suggests that homeless youth who report having depressive symptoms also report infrequent condom use (Rohde et al., 2001), while another study found no relationship between depression and condom use (Marshall et al., 2009). A final predictor of positive outcomes is session attendance. Studies find that longer retention in treatment is associated with better outcomes (McKay, 2005; Simpson, 2004). In conclusion, identifying factors that predict change in HIV risk (behaviors among this population, including clarifying the relationship to depressive symptoms, could shed light on how to improve interventions seeking to reduce the risk for contracting HIV.

1.3. Current study

The current study tested an integrated intervention - two-sessions of HIV prevention with substance use treatment - for substance use disordered, street living youth. The first goal was to examine the impact of the integrated intervention on risk behaviors across time. It was expected that HIV knowledge and condom use would increase, while the number of sexual partners, and other HIV risk behaviors would decrease from baseline to the 12-month follow-up. The second aim was to examine predictors of change. It was expected that reductions in substance use and depressive symptoms, as well as a higher number of sessions attended, would be associated with reductions in HIV risk behaviors. Finally, given differences in response to HIV prevention by gender (e.g., Rotheram-Borus et al., 2003), gender was examined as a moderator of change.

2. Methods

2.1 Participants

Homeless youth ($N = 270$) were recruited from the only drop-in center serving homeless youth in Central Ohio. Eligible participants met the criteria of homelessness as defined by the McKinney-Vento Act (2002) and met Diagnostic and Statistical Manual for Mental Disorders-IV (American Psychiatric Association, 2000) criteria for abuse or dependence for Psychoactive Substance Use or Alcohol Disorder, as assessed by the Computerized Diagnostic Interview Schedule (CDIS; Shaffer, 1992). A summary of the demographic characteristics of the current sample is presented in Table 1.

2.2 Materials

Demographic variables, including youth's race/ethnicity, gender, age, and childhood abuse history, were measured at baseline. Overall treatment attendance was represented by the percentage of sessions attended divided by the maximum number of possible treatment sessions (14 for CRA and CM, and 4 for MET). Frequency of alcohol and drug use was

measured by the Form 90, developed for the NIAAA funded Project Match (Miller, 1996). This structured questionnaire combines the timeline follow-back method (Sobell & Sobell, 1992) and grid averaging. Youth were asked to recall the frequency and amount of substances used in the past 90 days, and responses were recorded on a calendar. Weekly grids were used with patterned substance use behavior. Interviewers used memory aids to assist clients' recall of substance use frequency. The Form 90 has shown good test-retest reliability with youth (Slesnick & Tonigan, 2004). Youth's depressive symptoms were measured by the Beck Depression Inventory-II (BDI-II; Beck, Steer, & Brown, 1996). Internal reliability of the BDI for this study ranged from 0.94 and 0.95.

The Health Risk Questionnaire (HRQ; Slesnick, Bartle-Haring, Glebova, & Glade, 2006; Slesnick & Prestopnik, 2005) incorporates items from the Health Risk Survey (Kann, Nelson, Jones, & Kolbe, 1989) and the Homeless Youth Questionnaires (Johnson, Aschkenasy, Herbers, & Gillenwater, 1996), which together address a wide range of HIV-attitudes, knowledge and risk behaviors. Condom use frequency was measured by a single yes/no item, "In the last 3 months, have you or your partner always used a condom or rubber?" Number of sexual partners was assessed by the question, "With how many people have you had sexual intercourse in the past 3 months." An HIV knowledge subscale, consisting of 22 yes/no items, was summed for a total knowledge score. Although condom use frequency was considered the primary outcome in the current study, an overall HIV risk index was also aggregated using 8 items in the HRQ as suggested by Johnson et al. (1996). These 8 items query high risk sexual behaviors including IV drug use, sharing needles, multiple sexual partners, high-risk sexual partners, anal sex, irregular condom use, survival sex, and ever having had an STD.

2.3 Procedure

Homeless youth were engaged and screened by a research assistant at the drop-in center. Those youth who met inclusion criteria and agreed to participate in the study signed a consent/assent form and completed a baseline assessment. Next, youth were randomly assigned to either the Community Reinforcement Approach (n = 93), Motivational Enhancement Therapy (n = 86) or Case Management (n = 91) based on an urn randomization program. Youth were evaluated at 3, 6, and 12 months post-baseline assessment. Participants were reimbursed with a \$25 gift card at completion of the baseline assessment battery, a \$50 gift card at each follow-up assessment, and a \$5 gift card for each treatment session attended. All procedures in this study were approved by the University's Institutional Review Board.

Interventions—The Community Reinforcement Approach (CRA; Meyers & Smith, 1995) is a 12-session operant-based treatment for substance use disorders. CRA therapists help youth identify positive, reinforcing behaviors that compete with substance use. Therapists also teach and promote communication and problem-solving skills (Godley et al., 2001; Meyers & Smith, 1995). Motivational Enhancement Therapy (MET) includes 2 sessions based on an adapted version of Motivational Interviewing (Miller & Rollnick, 2002). MET seeks to enhance intrinsic motivation within the client. Preliminary data has suggested that one session of MET yields reductions in substance use among homeless youth for up to one

month post-intervention (Baer, Peterson, & Wells, 2004). Youth in the Case Management (CM) condition received 12 sessions focused on support and linkage to address their multiple service needs including basic needs, mental and physical health, legal support, education and employment.

All youth received a 2-session HIV intervention regardless of their substance use treatment modality. The HIV sessions are based on *Becoming a Responsible Teen*, which has been shown effective in reducing sexual risk behaviors and increasing AIDS risk knowledge among non-homeless youth (Kelly, St. Lawrence, Hood, & Brasfield, 1989; St. Lawrence, Jefferson, Alleyne, & Brasfield, 1995). The first session provides youth with AIDS education, assessment of risk, risk reduction, and skills practice. Therapists discuss abstinence, barriers to condom use, and individual levels of risk, including sexual risk behaviors and substance use risk. Youth practice effectively applying a condom using a model and improve their skills cleaning hypodermic needles. The second session is aimed at improving refusal skills, sexual assertiveness, and negotiation skills. Youth role-play how to discuss using condoms in advance with a partner, how to refuse pressure to engage in unprotected sex, and how to refuse sharing needles. Also, youth discuss and role-play a previous experience that involved assenting to pressure as an anticipated situation that may be difficult for them to handle in the future.

Four masters-level therapists provided the interventions. Therapists ranged from 2 to 10 years of experience in treating substance use disorders. For this study, training included readings, a two-day didactic, and weekly supervision. Audiotapes of treatment sessions were used to ensure treatment fidelity. Two undergraduate students and one master's level student reviewed a portion (10%) of the CRA and MET audiotapes. Fidelity was not recorded for CM sessions because these sessions were often conducted in the field. The average number of procedures used during a CRA session was 5.60 out of 9 potential procedures ($SD = 2.18$, range 2.00–9.00). MET showed higher adherence with 10 out of 10 procedures used in each session ($SD = 0$). Therefore, good therapist adherence was found among CRA sessions while excellent adherence was found among MET sessions. Therapist competence in using a procedure was rated on a scale from 1–7. Scores averaged 5.21 for CRA sessions ($SD = 0.72$, range 3.66–7.00) and 5.39 for MET sessions ($SD = 0.38$, range 4.22–6.00), both of which were in the "done well" range.

2.4 Analytic Strategies

Changes in the percentage of youth always using a condom from baseline to the 6-month follow-up (end-of-treatment) and the 12-month follow-up (end-of-study) were analyzed by McNemar chi-square tests. For the period(s) exhibiting a significant difference in condom use frequency, youth were categorized into three groups (increased, no change, or reduced) based on their self-reported condom use frequency at baseline and the follow-up. Multinomial logistic regression was used to analyze predictors of group membership, including demographic variables, baseline drug use frequency and depressive symptoms, as well as treatment attendance.

For all other continuous variables, including the number of sex partners, HIV knowledge, and the HIV risk index, Hierarchical Linear Modeling (HLM) was used to analyze the

trajectories from baseline to the 12-month follow-up. Demographic variables which showed a significant association with the outcome variable were entered as predictors of the intercept. Treatment attendance was entered as a predictor of the slope of the time effect. Drug use frequency and depressive symptoms were entered as time-varying covariates, centered by group means. The analysis was conducted with the HLM7 software (Raudenbush, Bryk, & Congdon, 2011) using full maximum likelihood estimation.

3. Results

McNemar chi-square tests revealed a significant increase in the percentage of youth always using condoms from baseline to the 6-month follow-up [$\chi^2(1) = 5.39, p < 0.05$], but not from baseline to the 12-month follow-up [$\chi^2(1) = 0.15, p > 0.05$]. In order to further understand this finding, multinomial regression analysis was conducted with the groups reporting change in condom use frequency (increased, reduced, versus no change) from baseline to the 6-month follow-up. Higher drug use frequency at baseline was associated with a marginally lower likelihood of showing reduced condom use frequency and a significantly higher likelihood of showing increased condom use frequency than exhibiting no change (see Table 2). Higher treatment attendance was associated with a significantly lower likelihood of showing reduced condom use frequency than no change (OR = 0.22; 95% CI: 0.05–0.93). In other words, youth with higher drug use frequency at baseline and those who attended more treatment sessions were less likely to show reduced condom use frequency and more likely to exhibit increased condom use frequency at the 6-month follow-up.

From baseline to the 12-month follow-up, youth's HIV knowledge significantly increased [$b = 0.27, S.E. = 0.07, t(240) = 3.66, p < 0.001$] and the number of sex partners were significantly reduced [$b = -0.17, S.E. = 0.02, t(239) = -10.98, p < 0.001$]. However, the HIV risk index did not change. Increases in depressive symptoms over time were associated with increases in the HIV risk index [$b = 0.012, S.E. = 0.006, t(241) = 2.08, p < 0.05$] as well as the number of sex partners [$b = 0.007, S.E. = 0.003, t(241) = 2.42, p < 0.05$]. Gender was a significant moderator of change in the number of sex partners [$b = 0.20, S.E. = 0.02, t(239) = 11.06, p < 0.001$]. Specifically, males exhibited a significantly higher reduction in the number of sex partners than females. Treatment attendance and drug use frequency were not significant predictors of any of these trajectories.

4. Discussion

Among homeless youth, HIV risk reduction interventions report limited success in reducing HIV risk behaviors (e.g., Booth et al., 1999; Gleghorn et al., 1997; Milburn et al., 2012; Rew et al., 2007). This study sought to examine the longitudinal effects of an integrated HIV prevention on HIV risk behaviors and knowledge among a vulnerable, high risk sample of street living, homeless youth. Predictors of change were also identified as this information can offer useful guidance for future intervention development efforts.

As predicted, the intervention resulted in an increase in the percentage of youth who reported always using condoms at 6 months. However, this reported increase in condom use disappeared by 12 months. Among the few studies reporting an increase in condom use at post-intervention, a similar dissipation in condom use over time was found (e.g., Coyle et

al., 2006; Rotheram-Borus et al., 2003). Possibly, booster sessions could mitigate the diminishing treatment effects as suggested by Morrison-Beedy and colleagues (2006). In fact, future research might find that intervention and support offered to youth throughout the duration of the youths' homeless episode might be a powerful prevention against the return to high risk behavior.

In order to elucidate the factors that predict change in condom use, further analyses were conducted. Findings showed that youth who attended more treatment sessions were less likely to report reduced condom use at 6 months, consonant with research reporting a positive relationship between treatment attendance and other targeted outcomes (McKay, 2005; Simpson, 2004). Also, youth with a higher baseline frequency of substance use showed more condom usage at 6 months post-baseline, indicating that those at highest risk are those who also showed the greatest benefits from this intervention, at least in the short-term.

The intervention resulted in other positive findings. In particular, similar to Rew et al. (2007), HIV knowledge increased through the 12-month follow-up. Even so, studies conclude that higher knowledge is not necessarily related to positive behavior change (Booth et al., 1999). Similar to the findings of Slesnick and Kang (2008), the number of sex partners significantly decreased over time. While Booth et al. (1999) found a reduction in the number of sex partners at 3 months post-intervention, the reduction was not statistically significant. Booth et al. (1999) concluded that peer prevention educators may not be effective. Possibly, the use of professional substance use counselors, as in the current study, may have the greatest potential impact with this particular population.

Although the overall HIV risk index was not impacted, possibly due to a floor effect in the number of risk behaviors engaged during the assessment period (prior 3 months), changes in depressive symptoms were positively associated with changes in the overall HIV risk index, as well as multiple sex partners. This finding supports literature documenting depressive symptoms as a risk factor for HIV risk behaviors (Marshall et al., 2009; Rohde et al., 2001) and suggests that HIV prevention interventions may be most effective when addressing concomitant problems (depressive symptoms, substance use) and sexual risk behaviors simultaneously, in an integrated fashion.

And, finally, this study found a significant moderating effect for gender. Male youth reported a significantly higher reduction in the number of sex partners post-intervention than female youth. In contrast, Rotheram-Borus and colleagues (2003) found that female youth reported a reduced number of sex partners while male youth reported no change. However, the discrepant findings might be accounted for by sample differences. Rotheram-Borus's sample included a younger, shelter-recruited sample, while the current study used an older, street-recruited sample. Furthermore, depressive symptoms, most often observed among females and associated with multiple sex partners (DiClemente et al., 2001) were controlled in the current analysis.

4.1 Limitations

Several limitations should be noted. First, the findings are limited by a sample of convenience and may not generalize to youth who do not access drop-in centers, or who reside in other parts of the country. Because the HIV prevention was integrated with substance use treatment, it is not possible to know if the findings are due to the HIV prevention intervention or to the substance use treatment. Some have noted that even without an integrated HIV prevention intervention, substance use treatment alone is associated with reduced HIV risk behavior (Sorensen & Copeland, 2000). The integrated treatment was developed for use with substance use disordered youth and similar findings might not be found for youth who present with other primary mental health conditions, such as major depressive disorder. However, future research is needed that seeks to more fully understand the potential impact of integrating an HIV prevention intervention with other mental health interventions. Finally, youth may have provided a socially desirable response to sensitive information on substance use and sexual risk behaviors. In order to ameliorate this problem, RAs encouraged youth to respond openly and honestly to the assessment items, and were reminded that information would remain confidential.

4.2 Conclusion and Future Directions

This study's findings show that an HIV prevention intervention integrated with substance use treatment can increase condom use, at least in the short-term, as well as reduce the number of sexual partners, and increase knowledge up to 12 months post-baseline. These findings echo those with a similar sample of homeless youth in another part of the country (Slesnick & Kang, 2008). Additional research is needed to determine whether booster or continuing care sessions provide an opportunity to maintain increases in condom use among those experiencing homelessness. In addition, future research might determine that ending homelessness is likely to have the most powerful effect on reducing risk behavior. That is, the relatively weak HIV risk behavior outcomes reported by multiple studies of youth living on the streets suggest that homelessness may be the biggest barrier associated with health promoting behaviors. Evidence shows that among adults, even those receiving risk reduction services, lack of stable housing is a barrier to reducing risky behaviors (Elifson, Sterk, & Theall, 2007), while improved housing status is associated with a reduction in risk behaviors (Aidala, Cross, Stall, Harre, & Sumartojo, 2005). In summary, future studies should examine the role of housing on HIV risk behaviors among homeless youth, as risk behaviors are likely to continue at some level as long as youth are living on the streets.

Acknowledgments

This work was supported by NIDA Grant R01 DA013549.

References

- Aidala A, Cross JE, Stall R, Harre D, Sumartojo E. Housing status and HIV risk behaviors: Implications for prevention and policy. *AIDS and Behavior*. 2005; 9(3):251–265.10.1007/s10461-005-9000-7 [PubMed: 16088369]
- American Psychiatric Association. *Diagnostic and statistical manual of mental disorders*. 4. Washington, DC: American Psychiatric Association; 1994.

- Baer JS, Peterson PL, Wells EA. Rationale and design of a brief substance use intervention for homeless adolescents. *Addiction Research & Theory*. 2004; 12(4):317–334.10.1080/1606635042000236475
- Beck, AT.; Steer, RA.; Brown, GK. BDI-II, Beck Depression Inventory: Manual. 2. Boston, MA: Harcourt Brace; 1996.
- Booth RE, Zhang Y, Kwiatkowski CF. The challenge of changing drug and sex risk behaviors of runaway and homeless adolescents. *Child Abuse Neglect*. 1999; 23(12):1295–1306.10.1016/S0145-2134(99)00090-3 [PubMed: 10626612]
- Coyle KK, Kirby DB, Robin LE, Banspach SW, Baumler E, Glassman JR. All4You! A randomized trial of an HIV, other STDs, and pregnancy prevention intervention for alternative school students. *AIDS Education and Prevention*. 2006; 18(3):187–203.10.1521/aeap.2006.18.3.187 [PubMed: 16774462]
- DiCenso A, Guyatt G, Willan A, Griffith L. Interventions to reduce unintended pregnancies among adolescents: Systematic review of randomized controlled trials. *British Medical Journal*. 2002; 324(7351):1426–1430. [PubMed: 12065267]
- DiClemente RJ, Wingood GM, Crosby RA, Sionean C, Brown LK, Rothbaum B, Davies S. A prospective study of psychological distress and sexual risk behavior among Black adolescent females. *Pediatrics*. 2001; 108(5):e85–e85.10.1542/peds.108.5.e85 [PubMed: 11694669]
- Elifson KW, Sterk CE, Theall KP. Safe living: The impact of unstable housing conditions on HIV risk reduction among female drug users. *AIDS and Behavior*. 2007; 11(6 Suppl):45–55.10.1007/s10461-007-9306-8 [PubMed: 17828451]
- Gleghorn AA, Clements KD, Marx R, Vittinghoff E, Lee-Chu P, Katz M. The impact of intensive outreach on HIV prevention activities of homeless, runaway, and street youth in San Francisco: The AIDS Evaluation of Street Outreach Project (AESOP). *AIDS and Behavior*. 1997; 1(4):261–271.10.1023/A:1026231519630
- Godley SH, Meyers RJ, Smith JE, Karvinen T, Titus JC, Godley MD, Kelberg P. The adolescent community reinforcement approach for adolescent cannabis users. DHHS Publication No. (SMA) 01-3489. 2001
- Halcón LL, Lifson AR. Prevalence and predictors of sexual risks among homeless youth. *Journal of Youth and Adolescence*. 2004; 33(1):71–80.10.1023/A:1027338514930
- Haley N, Roy E, Leclerc P, Boudreau JF, Boivin JF. HIV risk profile of male street youth involved in survival sex. *Sexually Transmitted Infections*. 2004; 80(6):526–530.10.1136/sti.2004.010728 [PubMed: 15572629]
- Johnson TP, Aschkenasy JR, Herbers MR, Gillenwater SA. Self-reported risk factors for AIDS among homeless youth. *AIDS Education and Prevention*. 1996; 8:308. [PubMed: 8874648]
- Kann L, Nelson GD, Jones JT, Kolbe LJ. Establishing a system of complementary school-based surveys to annually assess HIV-related knowledge, beliefs, and behaviors among adolescents. *Journal of School Health*. 1989; 59:55–58. [PubMed: 2927091]
- Kelly JA, St Lawrence JS, Hood HV, Brasfield TL. Behavioral intervention to reduce AIDS risk activities. *Journal of Consulting and Clinical Psychology*. 1989; 57(1):60–67.10.1037/0022-006X.57.1.60 [PubMed: 2925974]
- Kerr T, Marshall BDL, Miller C, Shannon K, Zhang R, Montaner JSG, Wood E. Injection drug use among street-involved youth in a Canadian setting. *BMC Public Health*. 2009; 9:171–178.10.1186/1471-2458-9-171 [PubMed: 19493353]
- Marshall BD, Kerr T, Shoveller JA, Patterson TL, Buxton JA, Wood E. Homelessness and unstable housing associated with an increased risk of HIV and STI transmission among street-involved youth. *Health Place*. 2009; 15(3):753–760.10.1016/j.healthplace.2008.12.005 [PubMed: 19201642]
- Mazzaferro KE, Murray PJ, Ness RB, Bass DC, Tyus N, Cook RL. Depression, stress, and social support as predictors of high-risk sexual behaviors and STIs in young women. *Journal of Adolescent Health*. 2006; 39(4):601–603.10.1016/j.jadohealth.2006.02.004 [PubMed: 16982400]
- McKay JR. Is there a case for extended interventions for alcohol and drug use disorders? *Addiction*. 2005; 100(11):1594–1610.10.1111/j.1360-0443.2005.01208.x [PubMed: 16277622]

- McKay MM, Chasse KT, Paikoff R, McKinney LD, Baptiste D, Coleman D, Bell CC. Family-level impact of the CHAMP Family Program: A community collaborative effort to support urban families and reduce youth HIV risk exposure. *Family Process*. 2004; 43(1):79–93.10.1111/j.1545-5300.2004.04301007.x [PubMed: 15359716]
- McKinney-Vento Homeless Assistance Act, Re-Authorized. 42 U.S.C.11431 et seq 725; 2002.
- Meyers, RJ.; Smith, JE. Clinical guide to alcohol treatment: The community reinforcement approach. New York: Guilford Press; 1995.
- Milburn NG, Iribarren FJ, Rice E, Lightfoot M, Solorio R, Rotheram-Borus MJ, Desmond K, Duan N. A family intervention to reduce sexual risk behavior, substance use, and delinquency among newly homeless youth. *The Journal of Adolescent Health*. 2012; 50(4):358–364.10.1016/j.jadohealth.2011.08.009 [PubMed: 22443839]
- Miller, WR. Project MATCH Monograph Series. Vol. 5. U.S. Bethesda, MD: US Department of Health; 1996. Form 90: A structured assessment interview for drinking and related problem behaviors.
- Miller, WR.; Rollnick, S. Motivational interviewing: Preparing people for change. 4. New York: Guilford Press; 2002.
- Morrison-Beedy D, Jones SH, Xia Y, Tu X, Crean HF, Carey MP. Reducing sexual risk behavior in adolescent girls: Results from a randomized controlled trial. *Journal of Adolescent Health*. 2013; 52(3):314–321.10.1016/j.jadohealth.2012.07.005 [PubMed: 23299011]
- Naranbhai V, Abdool KQ, Meyer-Weitz A. Interventions to modify sexual risk behaviors for preventing HIV in homeless youth. *Cochrane Database of Systematic Reviews*. 2011; 110.1002/14651858.CD007501.pub2
- National Coalition for the Homeless. Fact Sheet #13: Homeless Youth. 2006. Retrieved February 26, 2014 from <http://www.nationalhomeless.org/factsheets/youth.pdf>
- Nyamathi A, Kennedy B, Branson C, Salem B, Khalilifard F, Marfisee M, Leake B. Impact of nursing intervention on improving HIV, hepatitis knowledge and mental health among homeless young adults. *Community Mental Health Journal*. 2013; 49(2):178–184.10.1007/s10597-012-9524-z [PubMed: 22797748]
- Picot J, Shepherd J, Kavanagh J, Cooper K, Harden A, Barnett-Page E, Jones J, Frampton GK. Behavioural interventions for the prevention of sexually transmitted infections in young people aged 13–19 years: A systematic review. *Health Education Research*. 2012; 27(3):495–512.10.1093/her/cys014 [PubMed: 22350195]
- Raudenbush, SW.; Bryk, A.; Congdon, R. HLM 7: Hierarchical linear and nonlinear modeling. Lincolnwood, IL: Scientific Software International; 2011.
- Rew L, Fouladi RT, Land L, Wong YJ. Outcomes of a brief sexual health intervention for homeless youth. *Journal of Health Psychology*. 2007; 12(5):818–832.10.1177/1359105307080617 [PubMed: 17855465]
- Rohde P, Noell J, Ochs L, Seeley JR. Depression, suicidal ideation and STD- related risk in homeless older adolescents. *Journal of Adolescence*. 2001; 24(4):447–460.10.1006/jado.2001.0382 [PubMed: 11549325]
- Rotheram-Borus MJ, Song J, Gwadz M, Lee M, Rossem RV, Koopman C. Reductions in HIV risk among runaway youth. *Prevention Science*. 2003; 4(3):173–187.10.1023/A:1024697706033 [PubMed: 12940468]
- Shaffer, D. The diagnostic interview schedule for children. New York: Columbia University; 1992.
- Simoni JM, Nelson KM, Franks JC, Yard SS, Lehavot K. Are peer interventions for HIV efficacious? A systematic review. *Aids and Behavior*. 2011; 15(8):1589– 1595.10.1007/s10461-011-9963-5 [PubMed: 21598034]
- Simpson DD. A conceptual framework for drug treatment process and outcomes. *Journal of Substance Abuse Treatment*. 2004; 27(2):99–121.10.1016/j.jsat.2004.06.001 [PubMed: 15450644]
- Slesnick N, Bartle-Haring S, Glebova T, Glade A. Homeless adolescent parents: HIV risk, family structure and individual problem behaviors. *Journal of Adolescent Health*. 2006; 39:774–777.10.1016/j.jadohealth.2006.04.021 [PubMed: 17046522]

- Slesnick N, Kang MJ. The impact of an integrated treatment on HIV risk behavior among homeless youth: A randomized controlled trial. *Journal of Behavioral Medicine*. 2008; 31 (1):45–59.10.1007/s10865-007-9132-5 [PubMed: 17940861]
- Slesnick N, Prestopnik JL. Ecologically based family therapy outcome with substance abusing runaway adolescents. *Journal of Adolescence*. 2005; 28:277–298.10.1016/j.adolescence.2005.02.008 [PubMed: 15878048]
- Slesnick N, Tonigan JS. Assessment of alcohol and other drugs used by runaway youths: A test-retest study of the Form 90. *Alcoholism Treatment Quarterly*. 2004; 22(2):21–34.10.1300/J020v22n02_03 [PubMed: 18563208]
- Sobell, LC.; Sobell, MB. Timeline follow-back. In: Litten, R.; Allen, J., editors. *Measuring alcohol consumption*. Totowa, NJ: Humana Press; 1992. p. 41-72.
- Solorio MR, Rosenthal D, Milburn NG, Weiss RE, Batterham PJ, Gandara M, Rotheram-Borus MJ. Predictors of sexual risk behaviors among newly homeless youth: A longitudinal study. *Journal of Adolescent Health*. 2008; 42(4):401–409.10.1016/j.jadohealth.2007.09.023 [PubMed: 18346666]
- Sorensen JL, Copeland AL. Drug abuse treatment as an HIV prevention strategy: A review. *Drug and Alcohol Dependence*. 2000; 59(1):17–31.10.1016/S0376-8716(99)00104-0 [PubMed: 10706972]
- St Lawrence JS, Jefferson KW, Alleyne E, Brasfield TL. Comparison of education versus behavioral skills training interventions in lowering sexual HIV-risk behavior of substance-dependent adolescents. *Journal of Consulting and Clinical Psychology*. 1995; 63(1):154–157.10.1037/0022-006X.63.1.154 [PubMed: 7896983]
- Tyler KA, Gervais SJ, Davidson MM. The relationship between victimization and substance use among homeless and runaway female adolescents. *Journal of Interpersonal Violence*. 2013; 28(3): 474–493.10.117/0886260512455517 [PubMed: 22935946]

Highlights

- Findings support HIV prevention with substance use treatment for homeless youth.
- Males showed a higher reduction in the number of sex partners than females.
- The observed increase in condom use dissipated once treatment ended.
- Condom use findings suggest a need for intervention throughout homelessness.
- Homelessness itself is likely a barrier to health-promoting behaviors.

Table 1

Demographic characteristics of the sample (N = 270).

Variable [n (%)]	Baseline (n = 270)	3-m FU (n = 202)	6-m FU (n = 202)	12-m FU (n = 203)
<u>Gender</u>				
Female	128 (47.41)			
<u>Ethnicity</u>				
African American	177 (65.56)			
White, not Hispanic	53 (19.6)			
Hispanic	6 (2.22)			
Native American	2 (0.74)			
Asian American	1 (0.37)			
Other	31 (11.48)			
<u>Abuse history</u>				
Physical abuse	118 (43.70)			
Sexual abuse	81 (30.00)			
<u>HIV risk behaviors during the last 3 months</u>				
Always use a condom/rubber ^d	82 (30.37)	71 (35.15)	79 (39.11)	59 (29.06)
Injected drug use	4 (1.48)	2 (0.99)	1 (0.50)	1 (0.50)
Shared needles	0	0	1 (0.50)	1 (0.50)
Had sex with more than 1 partner within 24 hours	28 (10.37)	24 (11.88)	24 (11.88)	26 (12.87)
Had sex with high-risk sex partner	10 (3.70)	7 (3.47)	5 (2.48)	6 (2.97)
Engaged in anal sex	26 (9.63)	20 (9.90)	16 (7.92)	19 (9.41)
Engaged in survival sex	7 (2.59)	9 (4.46)	7 (3.47)	5 (2.48)
Had STD or VD	63 (23.33)	42 (20.79)	56 (27.72)	50 (24.75)
<u>Condom use frequency change from baseline to the 6-m follow-up^b</u>				
Increased			24 (11.88)	
No change			109 (53.96)	
Decreased			43 (21.29)	
Variable [Mean (SD)]	Baseline	3-m FU	6-m FU	12-m FU
Age	18.74 (1.26)			
Age of first time homelessness	15.89 (3.44)			
Number of days currently without shelter	69.20 (175.94)			
Overall treatment attendance	0.52 (0.38)			
Percent days of any drug use except tobacco and alcohol	60.67 (37.07)	49.63 (41.48)	44.46 (40.12)	45.13 (39.02)
BDI-II total score	15.29 (13.43)	12.08 (12.83)	10.08 (11.67)	9.75 (11.59)
Percent days of homelessness	64.85 (38.55)	46.79 (44.54)	29.36 (39.95)	21.10 (34.96)
Number of sex partners ^c	1.58 (2.48)	0.62 (1.03)	0.66 (1.17)	0.81 (1.45)
Female	1.54 (2.5)	1.05 (1.18)	1.14 (1.4)	1.33 (1.48)
Male	1.62 (2.46)	.15 (.53)	.16 (.5)	.25 (1.19)
HIV risk index ^d	1.22 (0.91)	1.11 (1.02)	1.14 (1.00)	1.21 (1.90)
HIV knowledge	17.36 (4.01)	17.42 (4.33)	17.98 (4.19)	18.12 (4.23)

^aThis variable was reverse coded when calculating HIV risk index.

^bThis variable was created by the answers to the question “In the last 3 months, have you or your partner always used a condom or rubber” at baseline and the 6-month follow-up.

^cThe skewness of this variable was high (ranged from 3.25 to 6.21), thus the Ln-transformed value was used for the HLM analysis

^dThis variable was computed by summing up the total positive answers to the 8HIV risk behaviors.

Table 2

Multinomial logistic regressions predicting condom use frequency change group with “No change” as reference group and HLM results of HIV knowledge, number of sex partner and HIV risk index.

Predictors	Change in condom use frequency from baseline to the 6-month follow-up					
	“Reduced” versus “No change” OR [95% CI]			“Increased” versus “No change” OR [95% CI]		
Percent days of any drug use except tobacco and alcohol at baseline				0.99 [†] [0.97, 1.00]		1.01 [*] [1.00, 1.03]
Treatment attendance				0.22 [*] [0.05, 0.93]		1.24 [0.40, 3.85]
BDI-II total score at baseline				1.03 [0.99, 1.07]		1.00 [0.98, 1.03]

Fixed Effect	HIV knowledge		No. of sex partner		HIV risk index	
	Coefficient	SE	Coefficient	SE	Coefficient	SE
For Intercept						
Intercept	17.59***	0.28	0.63***	0.03	1.38***	0.07
Age			-0.05***	0.02		
Sexual abuse	0.79 [†]	0.41				
Physical abuse	0.13	0.38				
For Time slope						
Intercept	0.27***	0.07	-0.17***	0.02	0.03	0.03
Treatment attendance	0.19	0.17	0.03	0.02	-0.05	0.06
Gender			0.20***	0.02		
For BDI-II slope						
Intercept			0.007 [*]	0.003	0.01 [*]	0.006

Random Effect	Variance	Variance	Variance
Intercept	5.03***	0.10**	0.63***
Time slope	0.003	0.007	0.02 [*]
BDI slope		0.00003	0.00005
Level-1 residual	6.34	0.16	0.65
Estimated parameters	9	13	11
Deviance statistic	3091.72	782.65	1779.53

 $p < 0.001$;
 **
 $p < 0.01$;
 *
 $p < 0.05$;
 $\dagger$
 $p < 0.10$.

Note: For the HLM analysis, demographic variables significantly related to the dependent variables at baseline were used as the predictors of the intercept. All demographic variables were entered as predictors of the time slope in the exploratory analysis and only significant ones were kept in the final model. Treatment attendance was centered by grand-mean. Drug use frequency and depressive symptoms were entered in the Level-1 equation as time-varying covariates with the group-mean centering in the preliminary analyses and only significant effects were kept in the final model.